

Claims

1. A computer implemented method for logically evaluating a Boolean expression used in a query statement, wherein the Boolean expression refers to an attribute and includes a plurality of conditions (C1, C2, C3), comprising the steps:  
receiving (410) the Boolean expression (310);  
decomposing (420) the Boolean expression (310) into the plurality of conditions (C1, C2, C3);  
for each condition of the plurality  
extracting (421) from the condition at least one condition value referring to the attribute, wherein the at least one condition value defines a value range of the condition;  
inserting (422) the at least one condition value in a condition value list in sorted order;  
initializing (423) a relationship vector for the at least one condition value; and  
adjusting (424) the relationship vectors for the at least one condition value and for each further condition value that is in the condition list and that is in the value range of the condition.
2. The method of claim 1, comprising the further step  
reducing (430) the Boolean expression according to each relationship vector.
3. The method of claims 1 or 2, wherein the extracting step (421) retrieves a maximum condition value and/or a minimum condition value of the condition.

4. The method of any one of claims 1 to 3, wherein the extracting step (421) retrieves an identity condition value of the condition.
5. The method of any one of the claims 1 to 4, wherein the relationship vector comprises a LESS THAN component, an EQUAL TO component and a GREATER THAN component .
6. The method of claim 5, where the initializing step (423) is performed by  
setting each relationship vector component for the at least one condition value to an initial value if the condition list has no further condition value;  
setting each relationship vector component to the LESS THAN component value of the relationship vector for the next greater condition value in the condition value list; or  
setting each relationship vector component to the GREATER THAN component value of the relationship vector for the next smaller condition value in the condition value list.
7. The method of claim 6, where the adjusting step (424) is performed by :  
incrementing at least one relationship vector component for the at least one condition value by an increment to reflect the condition; and  
propagating the increment through each relationship vector component for each further condition value in the condition list as long as the further condition value is within the value range of the condition.

8. The method of claim 7, wherein the reducing step (430) comprises:  
identifying an AND-subset (201) of condition values in the condition value list, where each subset condition value has at least one relationship vector component that has a value equal to the increment multiplied by the number of conditions in the plurality.
9. The method of claim 8, wherein the reducing step (430) further comprises:  
composing a reduced Boolean expression (320) based on the AND-subset.
10. The method of claim 7, wherein the reducing step (430) comprises:  
identifying an OR-subset (202) of condition values in the condition value list, where each subset condition value has at least one relationship vector component with the initial value.
11. The method of claim 10, wherein the reducing step (430) further comprises:  
composing a reduced Boolean expression (320) based on the OR-subset.
12. The method of claim 8, further comprising:  
if the AND-subset (201) is empty, sending a corresponding notification to a user.
13. The method of claim 10, further comprising:  
if the OR-subset (202) is empty, sending a corresponding notification to a user.

14. The method of claims 9 or 11, where the reduced Boolean expression (320) comprises a condition that merges at least a first condition and a second condition, the first and second conditions referring to the attribute and representing disjoint intervals, the attribute having no values between the inner interval boundaries of the disjoint intervals.
15. A computer program product for logically evaluating a Boolean expression used in a query statement, stored on a data carrier, or carried by a signal and comprising a plurality of instructions that when loaded into a memory of a computing device (901) cause at least one processor of the computing device (901) to execute the steps of any of the claims 1 to 14.

16. A computer system (990) for logically evaluating a Boolean expression used in a query statement, wherein the Boolean expression (310) refers to an attribute and includes a plurality of conditions (C1, C2, C3), comprising:
- a computing device (901) having a memory to receive (410) the Boolean expression and to store a condition value list; and
  - having at least one processor for executing computer program instructions to:
    - decompose (420) the Boolean expression (310) into the plurality of conditions (C1, C2, C3);
    - for each condition of the plurality
      - extract (421) from the condition at least one condition value referring to the attribute, wherein the at least one condition value defines a value range of the condition;
      - insert (422) the at least one condition value in the condition value list in sorted order;
      - initialize (423) a relationship vector for the at least one condition value ; and
      - adjust (424) the relationship vectors for the at least one condition value and for each further condition value that is in the condition list and that is in the value range of the condition.
17. The computer system (990) of claim 16, wherein the at least one processor further executes computer program instructions to
- reduce (430) the Boolean expression (310) according to each relationship vector.

18. The computer system of any one of the claims 16 to 17, wherein the relationship vector comprises a LESS THAN component, an EQUAL TO component, and a GREATER THAN component.
19. The computer system of claim 18, wherein the computer program instructions causing the at least one processor to initialize (423) have:
  - a first portion to set each relationship vector component for the at least one condition value to an initial value if the condition list has no further condition value; and
  - a second portion to set each relationship vector component to the LESS THAN component value of the relationship vector for the next greater condition value in the condition value list; or to set each relationship vector component to the GREATER THAN component value of the relationship vector for the next smaller condition value in the condition value list.
20. The computer system of claim 19, wherein the computer program instructions causing the at least one processor to adjust (424) have:
  - a first portion to increment at least one relationship vector component for the at least one condition value by an increment to reflect the condition; and
  - a second portion to propagate the increment through each relationship vector component for each further condition value in the condition list as long as the further condition value is within the value range of the condition.

21. The computer system of claim 20, wherein the memory stores  
an AND-subset (201) of condition values in the condition value list, where each subset condition value has at least one relationship vector component that has a value equal to the increment multiplied by the number of conditions in the plurality.
22. The computer system of claim 21, wherein the at least one processor executes further computer program instructions to compose a reduced Boolean expression (320) based on the AND-subset (201).
23. The computer system of claim 20, wherein the memory stores  
an OR-subset (202) of condition values in the condition value list, where each subset condition value has at least one relationship vector component with the initial value.
24. The computer system of claim 20, wherein the memory stores  
an OR-subset of condition values in the condition value list, where each subset condition value has at least one relationship vector component with a value greater than the initial value.
25. The computer system of claims 23 or 24, wherein the at least one processor executes further computer program instructions to compose a reduced Boolean expression (320) based on the OR-subset (202).

26. The computer system of claim 21, where the at least one processor executes further computer program instructions to send a corresponding notification to a user, if the AND-subset (201) is empty.
27. The computer system of claim 23, where the at least one processor executes further computer program instructions to send a corresponding notification to a user, if the OR-subset (202) is empty.
28. The computer system of claims 22 or 25, where the memory stores a list of all values of the attribute; and the at least one processor executes further computer program instructions to merge at least a first condition and a second condition, the first and second conditions referring to the attribute and representing disjoint intervals, the attribute having no values between the inner interval boundaries of disjoint intervals.
29. A graphical user interface implementation configurable to provide a graphical user interface (GUI) to a user, whereby the graphical user interface (GUI) is suitable for receiving from the user a Boolean expression (310) for logical evaluation by performing the steps of any of the claims 1 to 14.